

In re Patent Application of:
HILL ET AL.
Serial No. 10/761,409
Filed: 01/22/2004

IN THE DESCRIPTION

Please amend paragraphs 0002 and 0011 as follows, and delete paragraphs 0013 to 0018.

[0002] The present invention relates to semiconductor nanocrystal layers doped with rare earth elements, to semiconductor structures comprising these semiconductor nanocrystal layers, ~~and to processes for preparing the semiconductor nanocrystal layers doped with rare earth elements.~~

[0011] In one aspect, the present invention provides a doped semiconductor nanocrystal layer, the doped semiconductor nanocrystal layer comprising (a) a group IV oxide layer which is free of ion implantation damage, (b) ~~from 30 to 50 atomic percent of a semiconductor nanocrystals~~ distributed in the group IV semiconductor oxide layer, and (c) from 0.5 to 15 atomic percent of one or more rare earth elements, ~~the~~ The one or more rare earth element are: being (i) dispersed on the surface of the semiconductor nanocrystal and (ii) distributed substantially equally through the thickness of the group IV oxide layer.

~~[0013] In another aspect, the present invention provides a process for preparing a doped semiconductor nanocrystal layer, the process comprising:~~

~~[0014] (a) subjecting a target comprising a mixture of (i) a powdered group IV binding agent, (ii) a powdered semiconductor~~

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~~selected from a group IV semiconductor, a group II-VI semiconductor and a group III-V semiconductor, and (iii) a powdered rare earth element, the rare earth element being present in concentration of 0.5 to 15 atomic percent, to a pulse laser deposition procedure to deposit a semiconductor rich group IV oxide layer doped with a rare earth element, and~~

~~{0015} (b) annealing the semiconductor rich group IV oxide layer doped with a rare earth element at a temperature of from 600°C. to 1000°C.~~

~~{0016} In another aspect, the present invention provides a process for preparing a doped semiconductor nanocrystal layer, the process comprising:~~

~~{0017} (a) introducing (i) a gaseous mixture of a group IV element precursor and molecular oxygen, and (ii) a gaseous rare earth element precursor, in a plasma stream of a Plasma Enhanced chemical Vapor Deposition (PECVD) instrument to form a semiconductor rich group IV oxide layer doped with a rare earth element, and~~

~~{0018} (b) annealing the semiconductor rich group IV oxide layer doped with a rare earth element at a temperature of from 600°C. to 1000°C.~~

[0026] The semiconductor nanocrystals that are dispersed within the group IV semiconductor oxide layer are preferably the nanocrystals of a group IV semiconductor, e.g. Si or Ge, or a group II-VI semiconductor, e.g. ZnO, ZnS ZnSe, CaS, CaTe or CaSe, or of a group III-V semiconductor, e.g. GaN, GaP or

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GaAs.. The nanocrystals are preferably from 1 to 10 nm in size, more preferably from 1 to 3 nm in size, and most preferably from 1 to 2 nm in size. Preferably, the ~~nanocrystals are~~ semiconductor material is present within the group IV semiconductor oxide layer in a concentration of from 30 to 50 atomic percent, more preferably in a total concentration of 37 to 47 atomic percent, and most preferably in a concentration of from 40 to 45 atomic percent.